AN IMPLEMENTATION OF THE BOUNDARY ELEMENT METHOD FOR ZONED MEDIA WITH STRESS DISCONTINUITIES

The author has presented an interesting systematization of the problems found when treating corners in BIEM discretization. It could be interesting, nevertheless, to examine the condition (f), displacements–displacement, contained in his section 'Boundary conditions and supplementary equations' (p. 6). When we treated this problem,[1,2] we decided to maintain a free parameter in spite of finding that the corner was locally solved for continuous evolutions of the displacement field. Of course this is produced by the discretization so that it *is possible to eliminate the equations related to the corner node.*

The new solution was described[3] for potential theory and has been extended to plane elasticity without problems, as follows.

Assuming the continuity of the displacement vector $\mathbf{u}^T = (u, v)$ at node 2 (Figure 1) it is possible to compute ∇u and ∇v at node 2 through the derivatives of the **u** values along the lines 12 and 23. This can be done directly in the analytical expression of the known **u** values or using the interpolatory data given to define the boundary conditions, i.e. the approach is not a finite difference one, but an exact result. Knowing both gradients it is immediate to compute $\boldsymbol{\varepsilon}$ and, using Hooke's law, $\boldsymbol{\sigma}$ and consequently the tractions $\mathbf{T}^{n_2^b}$ $\mathbf{T}^{n_2^a}$. That is, there are no unknowns at 2. In fact it is possible to speak of a corner element (Figure 1(b)) where the unknowns are related now to normal nodes. All the contributions of both corner branches can be computed without problems, and it has been possible to reduce the number of equations to be solved.

The same situation can be induced using what we called 'mixed' elements,[3] that is by using different interpolation degrees for displacements and stresses.

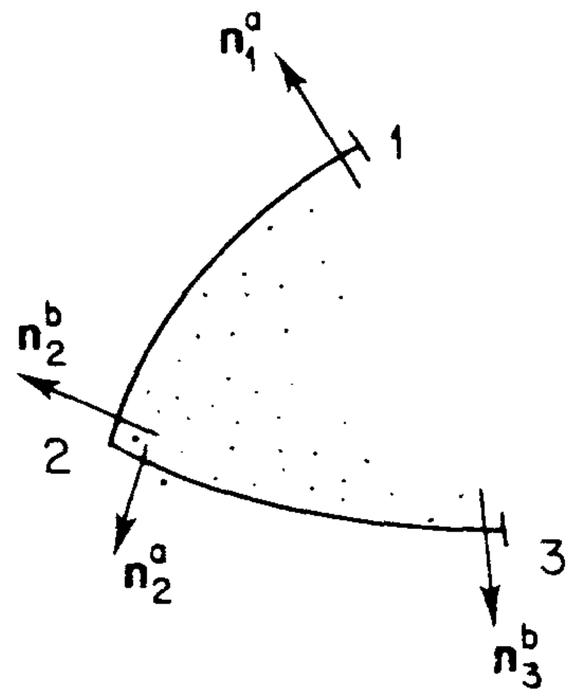

Figure 1. (a) Sharp corner: (b) Corner element